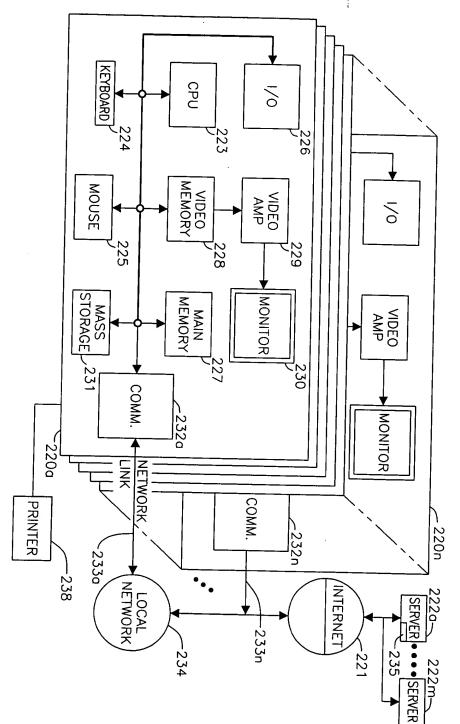Attorney: Raymond R. Tabandeh
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FIG. 1

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FIG.2

FINGERPRINT SCANNED IMAGE ⟵ 201

↓

IMAGE
PROCESSING ⟵ 202

↓

CONVERT DIGITAL
IMAGE TO BINARY
NUMBERS ⟵ 203

↓

IMPLIES BINARY NUMBERS AS
"PASSWORD" TO A
ENCRYPTION ALGORITHM ⟵ 204

↓

DATA ENCRYPTED WITH
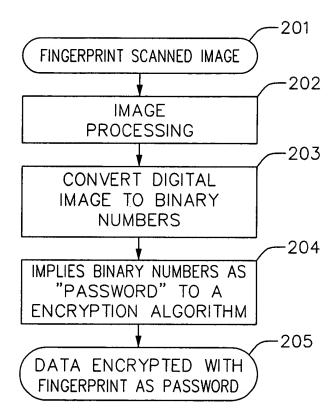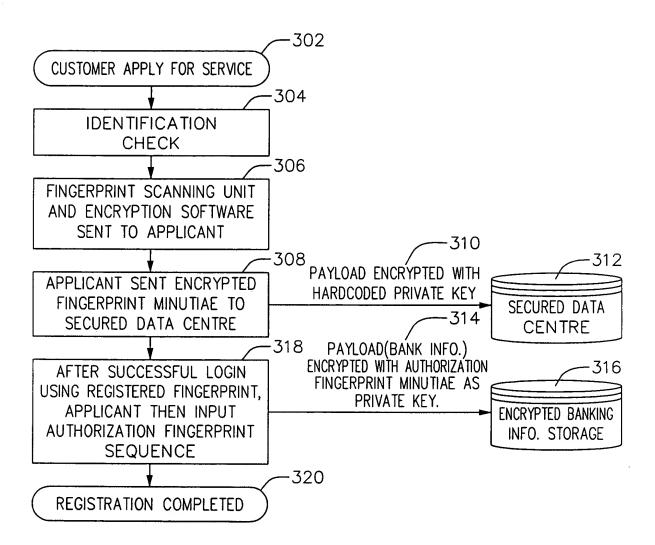FINGERPRINT AS PASSWORD ⟵ 205

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FIG.3

```
      ┌──────────────────────────────┐ ⟋302
      │  CUSTOMER APPLY FOR SERVICE  │
      └──────────────────────────────┘
                     │
                     ▼
      ┌──────────────────────────────┐ ⟋304
      │       IDENTIFICATION         │
      │           CHECK              │
      └──────────────────────────────┘
                     │
                     ▼
      ┌──────────────────────────────┐ ⟋306
      │  FINGERPRINT SCANNING UNIT   │
      │  AND ENCRYPTION SOFTWARE     │
      │     SENT TO APPLICANT        │
      └──────────────────────────────┘
                     │
                     ▼
      ┌──────────────────────────────┐ ⟋308
      │  APPLICANT SENT ENCRYPTED    │
      │  FINGERPRINT MINUTIAE TO     │
      │  SECURED DATA CENTRE         │
      └──────────────────────────────┘
                     │
                     ▼
      ┌──────────────────────────────┐ ⟋318
      │   AFTER SUCCESSFUL LOGIN     │
      │ USING REGISTERED FINGERPRINT,│
      │   APPLICANT THEN INPUT       │
      │  AUTHORIZATION FINGERPRINT   │
      │         SEQUENCE             │
      └──────────────────────────────┘
                     │
                     ▼
      ┌──────────────────────────────┐ ⟋320
      │    REGISTRATION COMPLETED    │
      └──────────────────────────────┘
```

⟋310 PAYLOAD ENCRYPTED WITH HARDCODED PRIVATE KEY → 312 SECURED DATA CENTRE

⟋314 PAYLOAD(BANK INFO.) ENCRYPTED WITH AUTHORIZATION FINGERPRINT MINUTIAE AS PRIVATE KEY. → 316 ENCRYPTED BANKING INFO. STORAGE

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FIG.4

MOBILE DEVICE

PERSONAL COMPUTER

POINT OF SALES

—420

—422

—424

FINGERPRINT READER

—426

CUSTOMER PERFORM A PURCHASE/ PAYMENT OPTION

CUSTOMER INPUT USER ID AND LOGIN FINGERPRINT SCAN —402

POPUP SCREEN SHOWING AVAILABLE CREDIT CARD TO CHOOSE FOR PAYMENT —404

—416

—418

MATCHING SERVER

CUSTOMER CHOOSE CREDIT/DEBIT CARD TO BE CHARGED TO AND SUBMIT AUTHORIZATION FINGERPRINT SEQUENCE —406

SECURE RELAY DATA CENTRE

CREDIT CARD INFORMATION THEN SENT TO MERCHANT BANK FOR CREDIT CLEARANCE —408

MERCHANT BANK PROCESS REQUEST AND RETURN APPROVAL CODE —410

SECURE RELAY DATA CENTRE

SYSTEM NOTIFY CUSTMER OF PURCHASE ACTION WITH PREDIFINED NOTIFICATION METHOD —412

APPROVAL CODE RETURN TO CUSTOMER. TRANSACTION COMPLETED —414

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FIG.5

502 — ON-LINE CUSTOMER CHOOSE M1 PAYMENT METHOD FROM CHECKOUT PAGE OF MERCHANT SITE

504 — CUSTOMER KEY IN USER ID AND LOGIN FINGERPRINT SCAN

505 — USER ID ENCRYPTED WITH LOGIN FINGERPRINT MINUTIAE

506 — SECURED RELAY DATA CENTRE DISPLAY POSSIBLE CHOICES OF CREDIT CARD

508 — CUSTOMER CHOOSE CREDIT CARD AND INPUT AUTHORIZATION FINGERPRINT SEQUENCE, MERCHANT SITE THEN TRANSMIT PURCHASE DETAIL

509 — ENCRYPTED WITH MERCHANT'S PRIVATE KEY

510 — SECURED RELAY DATA CENTRE LOOKUP CREDIT CARD INFO. AND SENT PROCESSING TO MERCHANT BANK

512 — MERCHANT BANK PROCESS REQUEST AND RETURN APPROVAL CODE TO SECURED RELAY DATA CENTRE

516 — PURCHASE DETAIL RETURNED TO MERCHANT SITE

514 — NOTIFY CUSTOMER WITH PURCHASE DETAIL

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PERSONAL COMPUTER
—602

—604
MOBILE DEVICE

632—
POS DEVICE

630—
MERCHANT

MODEM

—606 608— 606—
LOCAL ISP
ON-LINE SHOPPING MALL
MOBILE ISP

COMMUNICATION TOWER

TRANSACTION NOTIFICATION

FIRST FIREWALL —610a 610b SECOND FIREWALL RELAY DATA CENTER

—610a
ENCRYPTED BANKING INFO. STOTAGE

—610
MATCHING

COMMUNICATION CENTRE

TERMINAL SERVER

—612
NOTIFICATION SERVER

MODEM

SECURE RELAY DATA CENTRE

614—

MODEM

MERCHANT BANK SYSTEM

MERCHANT BANK SYSTEM

FINANCIAL NETWORK

620—

MERCHANT BANK SITE

FIG.6

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FIG.7

702

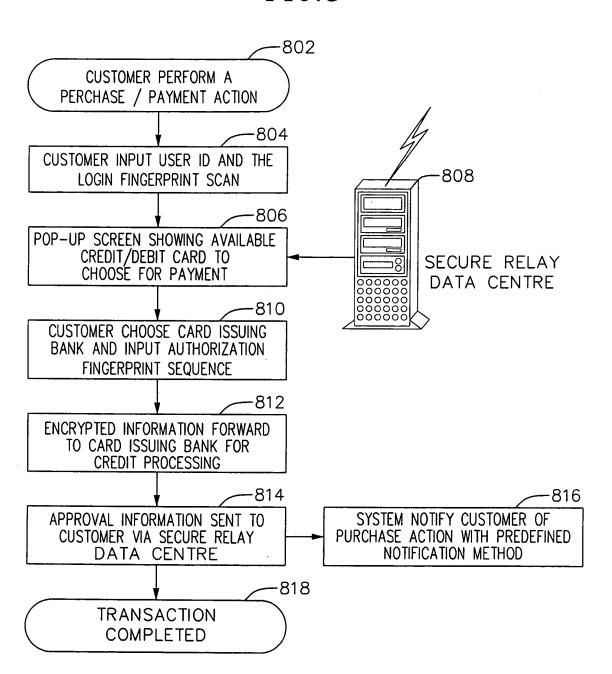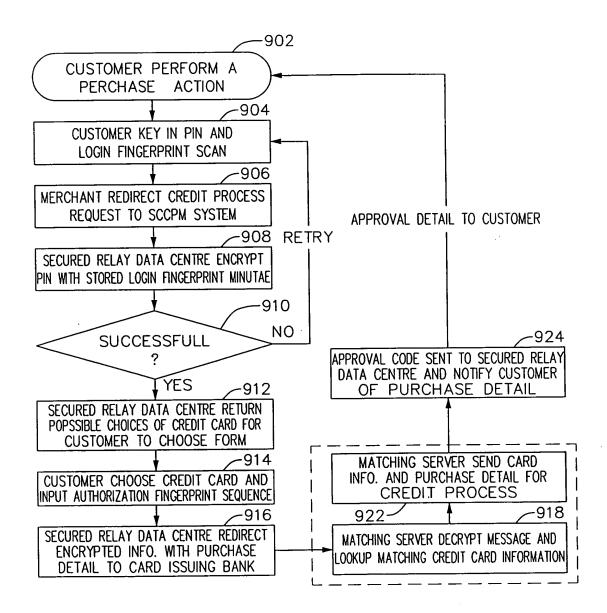APPLICANT SUBMIT CREDIT CARD APPLICATION TO CARD ISSUING BANK

704

APPLICATION APPROVED ?

NO → 706 APPLICATION UNSUCCESSFUL

YES

708

APPLICANT APPROACH THE NEAREST CARD ISSUING BANK TO FOR FINGERPRINT RECORDING PROCEDURE

710

RECORD LOGIN FINGERPRINT MINUTIAE

→ 712 INFORMATION STORED IN SECURED RELAY DATA CENTRE

714

RECORD AUTHORIZATION FINGERPRINT MINUTIAE SEQUENCE (MULTIPLE OK)

→ 716 INFORMATION STORED IN CARD ISSUING BANK'S MATCHING SERVER

718

RECORD RUNNING CHECK FINGERPRINT MINUTIAE

→ 720 INFORMATION STORED IN SECURED RELAY DATA CENTRE

722

SELECTED NOTIFICATION METHOD AND INFORMATION

→ 724 ACCOUNT APPLICATION PROCEDURE COMPLETED

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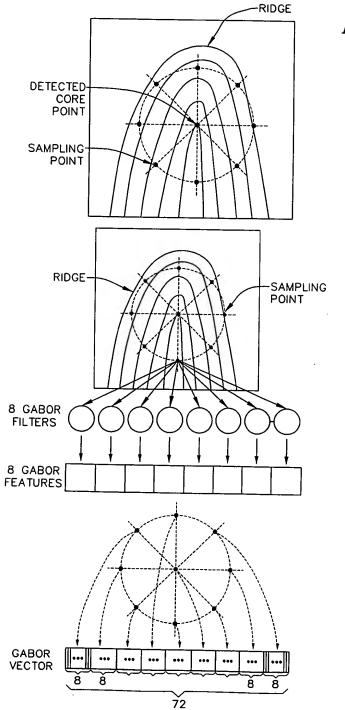SECURE CREDIT TRANSACTION PROCESSING
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FIG.8

802
CUSTOMER PERFORM A
PERCHASE / PAYMENT ACTION

804
CUSTOMER INPUT USER ID AND THE
LOGIN FINGERPRINT SCAN

806
POP-UP SCREEN SHOWING AVAILABLE
CREDIT/DEBIT CARD TO
CHOOSE FOR PAYMENT

808
SECURE RELAY
DATA CENTRE

810
CUSTOMER CHOOSE CARD ISSUING
BANK AND INPUT AUTHORIZATION
FINGERPRINT SEQUENCE

812
ENCRYPTED INFORMATION FORWARD
TO CARD ISSUING BANK FOR
CREDIT PROCESSING

814
APPROVAL INFORMATION SENT TO
CUSTOMER VIA SECURE RELAY
DATA CENTRE

816
SYSTEM NOTIFY CUSTOMER OF
PURCHASE ACTION WITH PREDEFINED
NOTIFICATION METHOD

818
TRANSACTION
COMPLETED

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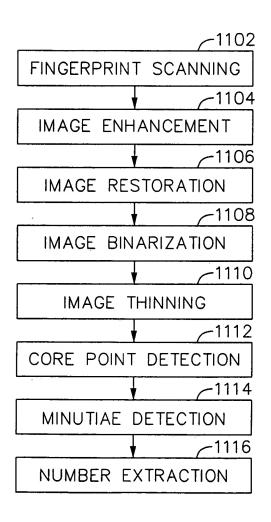SECURE CREDIT TRANSACTION PROCESSING
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FIG.9

902

CUSTOMER PERFORM A
PERCHASE ACTION

904

CUSTOMER KEY IN PIN AND
LOGIN FINGERPRINT SCAN

906

MERCHANT REDIRECT CREDIT PROCESS
REQUEST TO SCCPM SYSTEM

908

SECURED RELAY DATA CENTRE ENCRYPT
PIN WITH STORED LOGIN FINGERPRINT MINUTAE

910

SUCCESSFULL?

NO

RETRY

YES

912

SECURED RELAY DATA CENTRE RETURN
POPSSIBLE CHOICES OF CREDIT CARD FOR
CUSTOMER TO CHOOSE FORM

914

CUSTOMER CHOOSE CREDIT CARD AND
INPUT AUTHORIZATION FINGERPRINT SEQUENCE

916

SECURED RELAY DATA CENTRE REDIRECT
ENCRYPTED INFO. WITH PURCHASE
DETAIL TO CARD ISSUING BANK

APPROVAL DETAIL TO CUSTOMER

924

APPROVAL CODE SENT TO SECURED RELAY
DATA CENTRE AND NOTIFY CUSTOMER
OF PURCHASE DETAIL

MATCHING SERVER SEND CARD
INFO. AND PURCHASE DETAIL FOR
CREDIT PROCESS

922

918

MATCHING SERVER DECRYPT MESSAGE AND
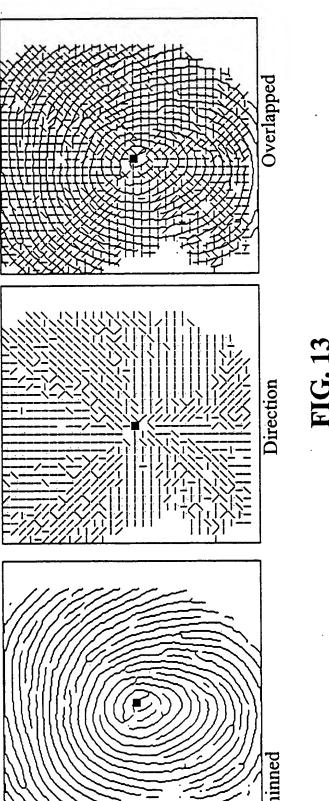LOOKUP MATCHING CREDIT CARD INFORMATION

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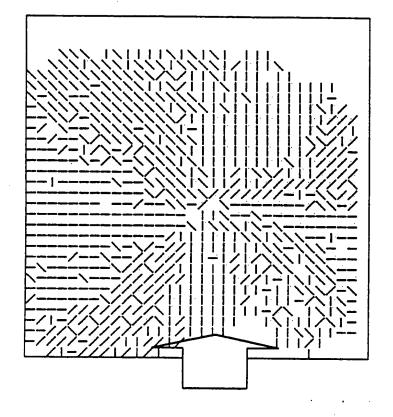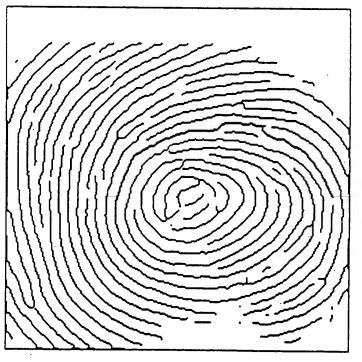Title: SYSTEM AND METHOD FOR CARDLESS
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FIG.10

RIDGE

DETECTED CORE POINT

SAMPLING POINT

RIDGE

SAMPLING POINT

8 GABOR FILTERS

8 GABOR FEATURES

GABOR VECTOR

8   8   8   8

72

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FIG.11

┌─────────────────────────────┐ ─1102
│   FINGERPRINT SCANNING   │
└─────────────────────────────┘
              ↓ ─1104
┌─────────────────────────────┐
│   IMAGE ENHANCEMENT   │
└─────────────────────────────┘
              ↓ ─1106
┌─────────────────────────────┐
│   IMAGE RESTORATION   │
└─────────────────────────────┘
              ↓ ─1108
┌─────────────────────────────┐
│   IMAGE BINARIZATION   │
└─────────────────────────────┘
              ↓ ─1110
┌─────────────────────────────┐
│   IMAGE THINNING   │
└─────────────────────────────┘
              ↓ ─1112
┌─────────────────────────────┐
│   CORE POINT DETECTION   │
└─────────────────────────────┘
              ↓ ─1114
┌─────────────────────────────┐
│   MINUTIAE DETECTION   │
└─────────────────────────────┘
              ↓ ─1116
┌─────────────────────────────┐
│   NUMBER EXTRACTION   │
└─────────────────────────────┘

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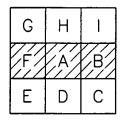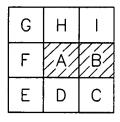SECURE CREDIT TRANSACTION PROCESSING
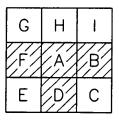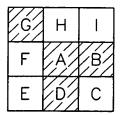Sheet 12 of 16

FIG. 12A

FIG. 12B

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Overlapped

Direction

Thinned

FIG. 13

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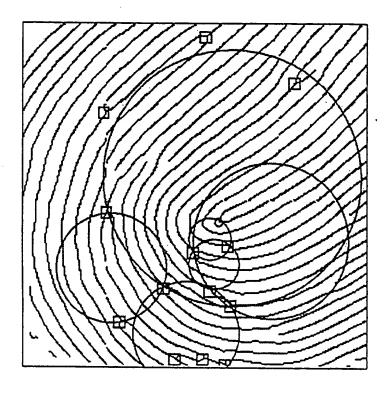Sheet 14 of 16

Fig. 14B

Fig. 14A

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FIG.15A

G	H	I
F	A	B
E	D	C

FIG.15B

G	H	I
F	A	B
E	D	C

FIG.15C

G	H	I
F	A	B
E	D	C

FIG.15D

G	H	I
F	A	B
E	D	C

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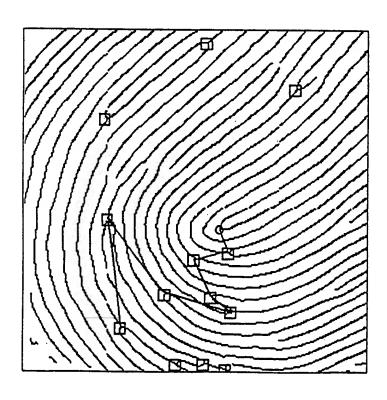SECURE CREDIT TRANSACTION PROCESSING
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FIG. 16B

FIG. 16A